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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: DISPLAY APPARATUS					
(57) Abstract					
<p>A display apparatus (1) is disclosed having an outer frame (2) and a window (3) formed by a transparent panel (6) through which a display representation can be viewed. The transparent panel (6) includes channels (12) which form part of the display representation and in which a light means such as a neon lamp (8) can be arranged. The display representation can be either painted or printed onto the rear surface of the transparent panel (6) or can be provided as a poster (7) which is sandwiched between the transparent panel (6) and a rear panel (9) of the apparatus (1).</p>					

+ DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

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DISPLAY APPARATUS

Field of the Invention

The present invention relates to advertising displays and in particular discloses a display apparatus that is provided in a ready for 5 use configuration.

Background Art

Neon lamps have been used for advertising and other displays for many years and are well known throughout the art. Such displays comprise 10 glass tubes filled with an inert gas, generally neon, or another gas or mixtures thereof. The gas is energised by a very high voltage which excites the gas until it glows. Neon lamps have the distinct advantage over other illuminated displays in that their light is penetrating and most distinct and appeals to the eye in a particular way.

However, there exist numerous problems in such display systems, 15 referred to herein as neon lamps for the sake of convenience. Firstly, such lamps, being manufactured out of glass, are highly prone to breakage. Generally, neon lamps are arranged in shop front windows or on the sides of buildings so as to attract the attention of passers by. In such applications, the glass tubes are not enclosed and can be struck by 20 hail or other objects and damaged quite easily. Also, rigid mechanical supports are used to secure the glass tubes in position. Such supports transmit vibrations and jarring to the glass which can result in fracturing and failure of the lamp.

Also, as such lamps operate at a very high voltage, corona 25 discharge about electrodes connecting the lamps can cause the formation of the poisonous gas ozone (O_3). Also, such lamps emit substantial ultraviolet light which is known to cause skin cancers. As the glass tubes are generally open to the atmosphere, and due to their electrical charge, they attract dust and dirt and because of the general 30 configuration of such displays are very difficult to clean.

There are also numerous problems associated with known neon lamps in their handling. Firstly, whilst they can be handled when operating, many electricity authorities require some form of shield or screen arranged near the neon display so as to prevent injury to persons.

35 Problems also arise with the characteristics of the glass tubing in that there are reasonable restrictions upon the amount of bending that can be applied to the glass tube. This is particularly relevant when forming letters out of the glass in that perfect 90° bends cannot be

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achieved. As such, letters such as "E" appear bent and curved. Also as the glass tube is continuous, it is generally required for intermediate sections of glass tube to be blacked out in order to distinguish different symbols and letters over the entire display. This is generally 5 achieved by painting, using black paint, those intermediate sections.

Because of their inherent character, neon displays are assembled on-site which gives rise to freighting problems and packaging which can cause breakages at various stages of transport and erection. Also, on-site erection and maintenance can involve substantial expense on the 10 part of the display owner.

Furthermore, light from known neon displays travels in every direction from the glass tubing and hence prior art signs are often visible in reverse from behind. This can be unsightly and in some cases requires the provision of a screen plate and a duplication of the display 15 on the reverse side. Again, further expense is required.

Object of the Invention

It is an object of the present invention to substantially overcome, or ameliorate, the abovementioned problems through provision of an improved display apparatus.

Summary of the Invention

In accordance with the present invention there is disclosed a display apparatus comprising a transparent panel forming a window through which a visual display can be seen, said transparent panel having formed on its rear surface a series of channels within which a light means can 25 be located, a substantially two-dimensional representation formed on or located adjacent to said rear surface, said representation and said light means forming said visual display, a rear panel including means for supporting said light means within said channels and between said transparent panel and said rear panel, and a frame adapted to support 30 said panels. Preferably, the display apparatus is adapted to be energised so as to illuminate the light means and to enhance the appeal of the visual display.

Also, the representation can be either painted or printed onto the rear surface of the transparent panel, or most preferably, is provided as 35 a poster which is locatable in a sandwich fashion between the transparent and rear panels.

Brief Description of the Drawings

A preferred embodiment of the present invention will now be described with reference to the drawings in which:

Fig. 1 is a front view of an advertising display of the preferred embodiment omitting some details for clarity;

Fig. 2 is a partial cross-section along the line II-II of Fig. 1;

Fig. 3 is a cut away perspective view of the various layers of Fig. 2; and

Fig. 4 illustrates the arrangement of the glass tubing and the advertising poster.

Best and Other Modes for Carrying Out the Invention

Referring to Fig. 1, a front elevation of the advertising display 1 is shown. The display 1 is supported by a frame 2 which defines a display window 3 through which advertising matter 4 can be seen.

As seen in Fig. 2, a transparent front panel 5 is provided for the display window 3. The front panel 5 is laid upon or, preferably, affixed to a moulded transparent panel 6 which includes channels 12 within which glass tubing 8 can be located. Glass tubing 8 runs behind the rear surface 13 of the moulded panel 6 and is supported by sponge supports 10 which are affixed to a rear panel 9. The sponge supports 10 are preferably polyurethane and provide a strong sponge support for the glass tubing. The supports 10 also act to hold against the rear surface 13 an opaque advertising poster 7 which, together with the glass tubing 8 forms the advertising matter 4 of Fig. 1.

The manner in which the glass tubing 8 is formed into letters and display illustrations is best seen in Fig. 3. Specifically, the glass tubing 8 is exposed through the display window 3 via the channels 12 and corresponding cut-out portions 15 in the advertising poster 7. Glass tubing interconnecting various letters and symbols runs behind the advertising poster 7 and is not seen through the window 3.

It will be understood by those skilled in the art that the glass tubing 8 can be filled with any variety of inert gases such as neon, xenon and other gases so as to produce colour displays when energised. Also, separate sections of tubing can be interconnected via electrical cables so as to provide various illumination colours in the display 1.

It will also be understood by those skilled in the art that the advertising display 1, by virtue of its frame 2, front panel 5 and rear panel 9 provides a sealed unit which substantially protects the glass

tubing 8 from breakage as well as ensuring confinement of any gases that may be ionised by the electric conductors supplying the glass tubing. As such, the generation of toxic gases such as ozone can be confined if not substantially reduced or eliminated.

5 Also, the front panel 5 and moulded panel 6 are preferably made of plastics materials which are formed out of laminations of acrylic including ultraviolet stabilisers. Those skilled in the art will realise that other plastics and possibly glass can be used as substitute materials. The provision of the UV stabiliser in the panels 5 and 6 10 prevents discolouration of the plastics material caused by sunlight and also reduces transmission of ultraviolet light from the illuminated glass tube 8 to persons viewing the display.

The panels 5 and 6 can be formed as a single panel and this is most preferred where a clear transparent panel is required. If a tinting of 15 the display window 3 is required, use of separate panels 5 and 6 as illustrated is preferred. This is because tint materials can cause deterioration of the mould required to form the moulded panel 6. This is overcome if only the front panel 5 is tinted. Alternatively, if moulding of the panel 6 is not preferred, the channels 12 can be formed by cutting 20 out sections of the panel 6 and overlaying the front panel 5.

It will also be understood by those skilled in the art that, instead of using an advertising poster 7, the rear surface 13 of the moulded panel can be painted so as enhance the appearance of the display 1. Due to light in all directions through the panel, the rear surface 13 25 illuminates. Hence any artwork, background, or in the present case, a poster 7 is illuminated thus enabling the poster 7 to be easily recognised whilst maintaining and enhancing the traditional effect of the lighting tubes. In previous systems, recognition of any such surface is extremely difficult due to the relative intensity and position of the 30 light source.

Fig. 4 illustrates a preferred use of an advertising poster 7 in relation to the channels 12 of the moulded panel 6. As seen in Fig. 4, and as earlier described, for small displays it is not possible to achieve accurate bending of the glass tubing 8. In this example, the 35 letter "E" includes rounded edges and where the tubing 8 is required to return to other letters behind the advertising poster 7, the tubing must be bent rearwardly and folded under the poster 7. At the centre of the E

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the tubing 8 is folded back on itself so as to form the lower part of the letter. The problems of bending the glass tube 8 cause inaccuracies in the ultimate display which can be rectified by suitable positioning of the advertising poster 7 about the channel 12. As seen in Fig. 4, the 5 advertising poster 7 includes a printed E 16 indicated by the cross-hatching. The interior section of the printed E 16 is formed as a cut-out 15, better seen in Figs. 2 and 3. The cut-portion 15 is arranged so as to overlap the channel wall 17 in order to encroach upon the channel 12. This arrangement provides for a number of effects. Firstly, 10 as the tubing 8 of the letter E protrudes into the channel 12, as seen best in Fig. 2, light is reflected about the walls of the channel 12 and in particular off mirror coatings 11 applied to the walls of the channel 12. As such, the overlapping portion of the advertising poster 7 that 15 protrudes into the channel 12 becomes illuminated and gives the effect of squaring-up the letter and reducing the visual impact of the rounded edges of the glass tubing. As such, trade marks can be rendered with integrity even for small displays.

In an alternative configuration, a metalised film 18 or other like material can be applied to the bottom of the channels 12 (facing the 20 window 3), as is illustrated for example, in the left channel seen in Fig. 2. The use of the film 18 provides for partial transmission of light from the tubing 8 through the transparent panels 6 and 5 as well as for some reflection of light back into the cavity 14, in a manner similar to the mirror coating 11. This can be used to provide a variety of 25 visual effects such as enhancing the aura of the display representation or advertising poster 7 or for permitting the display of colours generally not available using neon lamps. For example, colours such as gold and silver are not readily provided by energized gas filled tubes but a suitably coloured metal film 18 can permit the transmission of such 30 coloured light. Alternatively, the metalised film can be dark (translucent) or otherwise opaque to produce a substantially dark visual image on a light background.

There are numerous advantages provided by the advertising display 1. As already described, production of poisonous gases and ultraviolet 35 light can be substantially reduced or eliminated. Also, due to the enclosing of the glass tubing 8 and the use of a solid back panel 9, there is no reverse illumination. In order to obtain other visual effects, it will be understood that a transparent or translucent rear

panel can also be used. Also, the front panel and moulded panel can also be translucent. Because the advertising display 1 is a sealed unit, there is essentially no build up of dust and dirt on the glass tubing 8. Also, the advertising display is substantially resistant to shock and 5 breakage due to its complete construction and protection of the glass tubing using sponge supports 10. Accordingly, such a display lends itself to mass production and assembly in a factory environment and in a ready for sale configuration in which the purchaser can install his own sign. It is therefore envisaged that substantial savings in time and 10 money will be achieved by using the advertising display 1 especially with respect to installation and repair.

Also, as the advertising display mainly comprises plastics material, so, depending on the size, a substantially lightweight article is provided. The display 1 can be constructed in a variety of shapes and 15 sizes and is especially useful for indoor displays of a size similar to that of a picture frame. Because of its construction, the cross-sectional depth of the display 1 depends of the size of glass tubing 8 and as such, the typical depth of the display 1 in its smallest configuration is about 50 millimeters.

20 Because intermediate tubing connecting various letters and symbols of the display run behind the advertising poster 7, there is no requirement to paint these tubes black as is done in the prior art. Also, due to this tubing not being painted black, it emits light which provides soft illumination behind the poster 7 which provides for general 25 illumination of the entire display 1. Because of the abundance of light within the cavity 14 (Fig. 2) various visual effects can be implemented by providing variations in the construction. For example, the frame 2 can be manufactured of transparent material or have transparent windows so that light can be shed to the sides of the display 1. Alternatively, 30 the back panel 9 can have windows which provide for illumination of a wall behind the display 1. Those skilled in the art will understand that various other effects can be achieved in a similar way.

Also, due to the arrangement of the glass tubing 8 and the depth of the entire display, it is possible for a high voltage transformer to be 35 located within the channel 14. This transformer (not illustrated) provides for the conversion of main electricity supply to the high voltage required for the illumination of the gas within the glass tubes 8. Accordingly, the display 1 provides an entirely sealed unit for which

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mains supply can be directly applied and hence, if manufactured of plastics material is doubly insulated and presents no substantial electrical hazard.

In an alternative arrangement to that described above, the gas 5 filled glass tubing 8 (the neon lamp), can be replaced by an optical fibre arrangement, which emits light from the fibre surfaces.

Australian Patent Application Nos. 75325/87 and 53667/90 disclose a polymer-based optical fibre that not only transmits light along it's 10 length in a conventional manner, but also emits light along the length of the fibre surface thus creating a "wand" of light.

Such fibres can be provided in a variety of diameters such as 30 mm and 50 mm as known to the Applicant, and hence can be used for replacing neon tubing. The fibres are illuminated by a high intensity lamp, such as a mercury vapor lamp preferably focussed onto one end of the fibre. 15 The lamp can be located within the channel 14 in a similar manner to the transformer described above.

One advantage of this arrangement is that the fibres are flexible and hence assembly costs are substantially reduced. Also, the fibres are ductile and hence not fragile like glass tubing. Additionally, unlike 20 the glass tubing described, which includes a return forming a loop for energization, the fibre can be illuminated from one end. Where the length of the fibre incurs substantial loss of luminance, the fibre can be illuminated from both ends using the same lamp or an additional lamp. However, generally, the intensity of illumination is not as high as that 25 obtainable with neon lamps.

The foregoing describes only a number of embodiments of the present invention and modifications, obvious to those skilled in the art can be made thereto without departing from the scope of the present invention. For example, as earlier described, the front panel 5 and moulded panel 6 30 can be formed as a single panel which reduces the manufacturing process. Also, the display 1 can be located back to back with another display 1 so as to provide a bidirectional display.

Industrial Applicability

The present invention is applicable to advertising displays and the 35 like.

CLAIMS

1. A display apparatus comprising a transparent panel forming a window through which a visual display can be seen, said transparent panel having formed on its rear surface a series of channels within which a light means can be located, a substantially two-dimensional representation formed on or located adjacent to said rear surface, said representation and said light means forming said visual display, a rear panel including means for supporting said light means within said channels and between said transparent panel and said rear panel, and a frame adapted to support said panels.

2. Display apparatus as claimed in claim 1, wherein said light means is selected from the group consisting of gas filled glass tubing, and an optical fibre, said optical fibre both transmitting light along its length and emitting light from surfaces thereof.

3. Display apparatus as claimed in claim 2, wherein said gas filled glass tubing is adapted to be energized to emit light via a transformer.

4. Display apparatus as claimed in claim 3, wherein said transformer is located within said apparatus.

5. Display apparatus as claimed in claim 2, wherein at least one end of said optical fibre is supplied with high intensity light from a lamp.

6. Display apparatus as claimed in claim 5, wherein said lamp is located within said apparatus.

7. Display apparatus as claimed in claim 1, wherein said representation is printed onto the rear surface of the transparent panel.

8. Display apparatus as claimed in claim 1, wherein said representation is painted onto the rear surface of the transparent panel.

9. Display apparatus as claimed in claim 1, wherein said representation is a poster locatable in sandwich fashion between the transparent and rear panels.

10. Display apparatus as claimed in claim 9, wherein said poster includes cut-out sections through which said light means protrudes into said channels.

11. Display apparatus as claimed in claim 10, wherein the periphery of said cut-out sections protrude past adjacent walls of said channels.

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12. Display apparatus as claimed in claim 1, wherein walls of said channels formed in said transparent panel are mirror coated.

13. Display apparatus as claimed in claim 1, wherein a coating is provided on the bottom of said channels facing said window.

14. Display apparatus as claimed in claim 13, wherein said coating is a metalised film adapted to both transmit light therethrough and reflect light therefrom.

15. Display apparatus as claimed in claim 13, wherein said coating is translucent or opaque.

16. Display apparatus as claimed in claim 1, wherein said light means is mounted upon a plurality of supports depending from said rear panel.

17. Display apparatus as claimed in claim 16, wherein said representation is a poster locatable in sandwich fashion between said transparent panel and said supports.

18. Display apparatus as claimed in claim 1, further comprising a transparent front panel adjacent the front surface of said transparent panel.

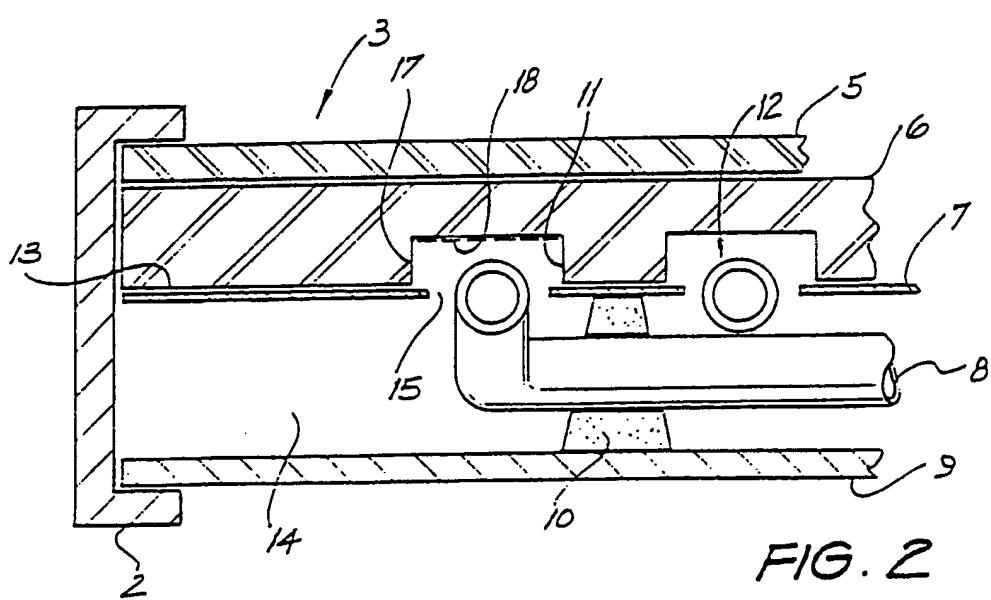
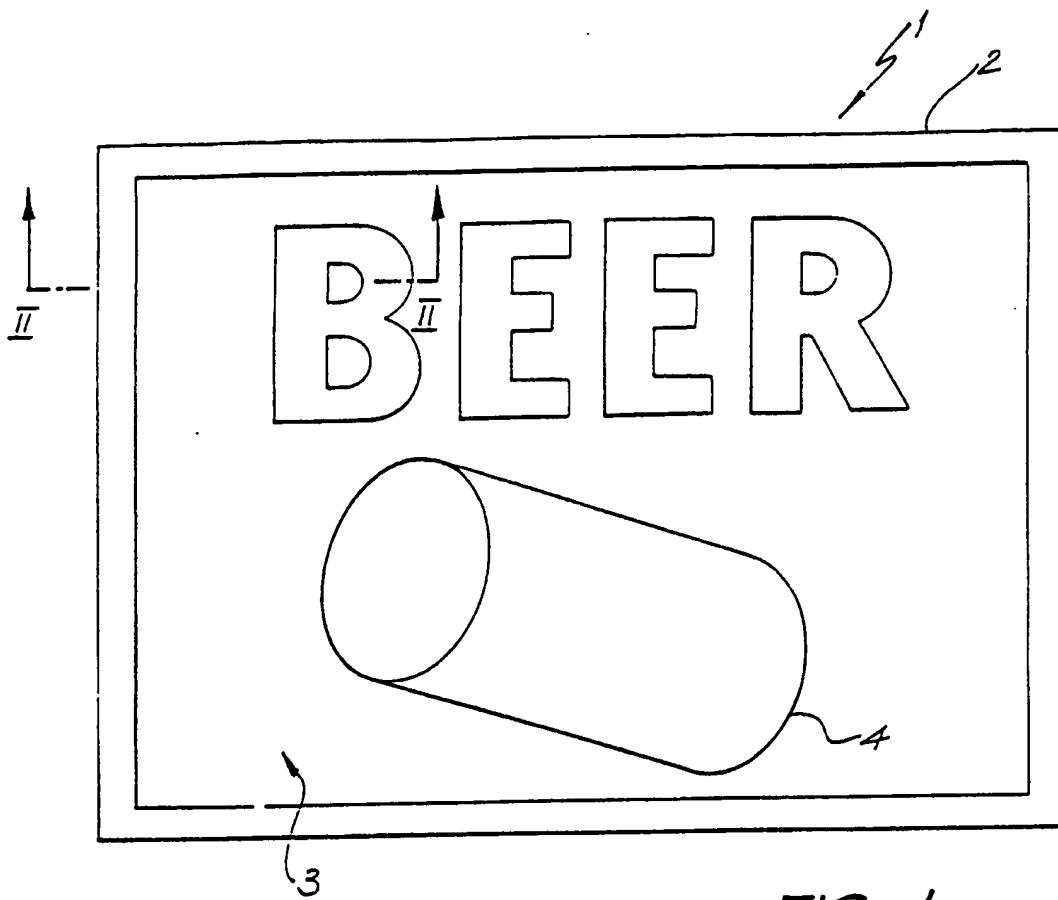
19. Display apparatus as claimed in claim 18, wherein said front panel is affixed to said transparent panel.

20. Display apparatus as claimed in claim 1, wherein said transparent panel is formed of a front sub-panel and an adjacent or affixed rear sub-panel in which said channels are formed by cutting out sections of said rear sub-panel.

21. A display device including two display apparatus as claimed in claim 1, arranged in back to back configuration.

22. A display device as claimed in claim 18, wherein said rear panels are provided as a single common rear panel to each said apparatus and representing a central panel of said device.

3 SHEETS, SHEET 1



SUBSTITUTE SHEET

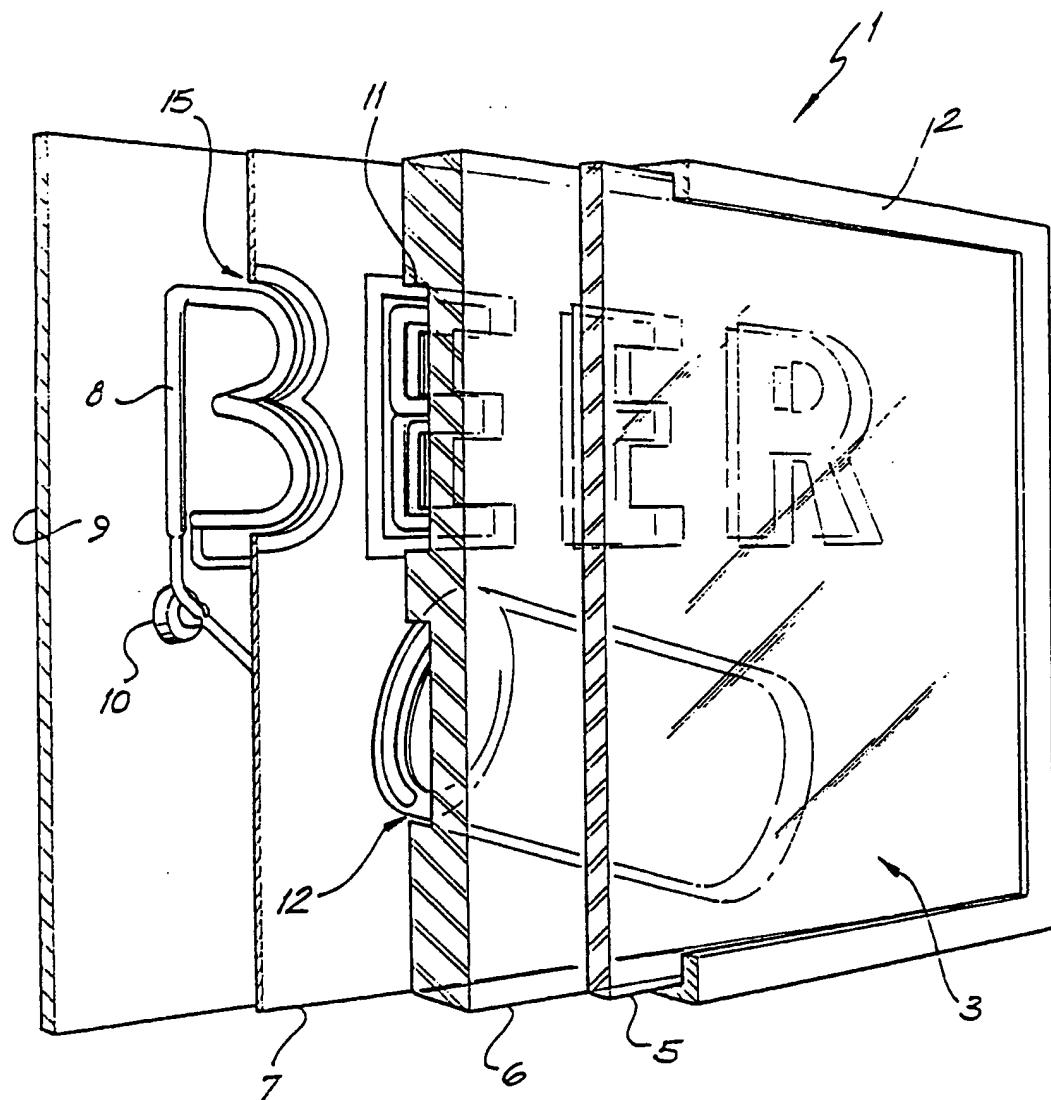


FIG. 3

SUBSTITUTE SHEET

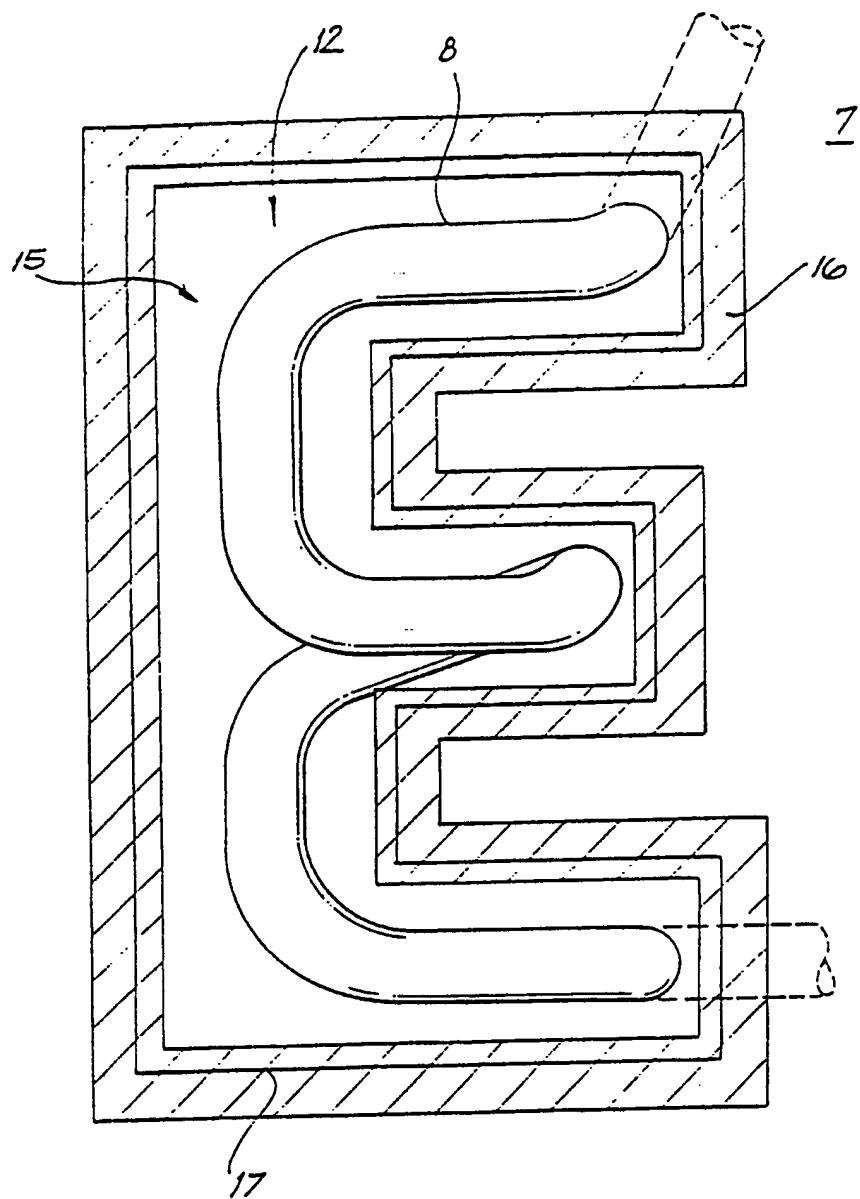


FIG. 4

SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶					
According to International Patent classification (IPC) or to both National Classification and IPC Int. Cl. ⁶ G09F 13/04, 13/26, 13/00.					
II. FIELDS SEARCHED					
Minimum Documentation Searched ⁷					
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; padding: 2px;">Classification System</th> <th style="text-align: left; padding: 2px;">Classification Symbols</th> </tr> </thead> <tbody> <tr> <td style="padding: 2px;">IPC</td> <td style="padding: 2px; text-align: center;">G09F 13/04, 13/26, 13/00</td> </tr> </tbody> </table>		Classification System	Classification Symbols	IPC	G09F 13/04, 13/26, 13/00
Classification System	Classification Symbols				
IPC	G09F 13/04, 13/26, 13/00				
<small>Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched⁸</small>					
AU:IPC as above JOPAL: as above					
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹					
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate of the relevant passages ¹²	Relevant to Claim No ¹³			
Y	US.A, 1654350 (SHELTON) 27 December 1927 (27.12.27)	(1-4,12-16, 18,21,22)			
A	US.A, 3919798 (MUTZAS) 18 November 1975)				
A	US.A, 4355479 (THORNTON) 26 October 1982) (26.10.82)				
A	US.A, 4292752 (CLARK) 06 October 1981) (06.10.81)				
A	DERWENT Abstract Accession no. P2749 E/44, Class P85, DE 3113-773 (BOSCH R GMBH) 28 October 1982 (28.10.82)				
(continued)					
" Special categories of cited documents : ¹⁰ "A" Document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date " L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means " P" document published prior to the international filing date but later than the priority date claimed		" T" Later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention " X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step " Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art " &" document member of the same patent family			
IV. CERTIFICATION					
Date of the Actual Completion of the International Search 11 December 1991 (11.12.91)	Date of Mailing of this International Search Report 17 December 91				
International Searching Authority AUSTRALIAN PATENT OFFICE	Signature of Authorized Officer V.O.Nunn 				

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

A	DERWENT Abstract Accession no. G1683C/29, Class P85, DS 2854-469 (STREY B) 10 July 1980 (10.07.80)	
A	DERWENT Abstract Accession no D 6127X/16, DT 2544-914 (NORTHERN ELECTRIC CO) 08 April 1976 (08.04.76)	
A	DE,A, 852335 (PRIECHENFRIED) 12 October 1952 (12.10.52)	

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claim numbers ..., because they relate to subject matter not required to be searched by this Authority, namely:
2. Claim numbers ..., because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. Claim numbers ..., because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4a

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

This International Searching Authority found multiple inventions in this international application as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:
4. As all searchable claims could be searched without effort justifying an additional fee, the International Searching Authority did not invite payment of any additional fee.

Remark on Protest

The additional search fees were accompanied by applicant's protest.

No protest accompanied the payment of additional search fees.

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON
INTERNATIONAL APPLICATION NO. PCT/AU 91/00392

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report	Patent Family Member
US 1654350	
DE 852335	
US 3919798	
DT 2544914	
DS 2854469	
US 4292752	
DE 3113773	
US 4355479	

END OF ANNEX